(Article from Australian Reader's Digest - June 2011 -)

THE FUTURE OF FARMING?

With food production under threat from population growth and shrinking agricultural space, **Tim Bouquet** investigates the most radical solution yet

It's a grey, drizzly day at Paignton Zoo in south-west England. Sensible animals are taking shelter, but people's noses are pressed to the plastic skin of an unusually lofty greenhouse.

Their mouths are wide open, too, but their eyes are not deceiving them – 11,000 plants really are on the move. Massed trays of rocket, spinach, bok choy, chicory, chard and herbs on eight levels of trays are


CHILLIES


CHIVES


LETTUCE


CHERRIES

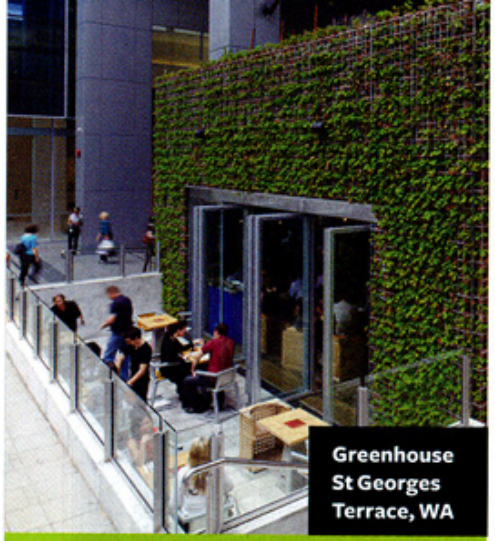

APPLES


CABBAGE


STRAWBERRIES

A vision of things to come? "Living skyscrapers" would combine residential units (in the middle) with areas to grow fruit and vegetables

ILLUSTRATION: BLAKE KURASEK



Greenhouse St Georges Terrace, WA

FORGET FOOD MILES, THINK FOOD METRES!

Imagine dining out at a restaurant where the ingredients are so fresh they're growing as you order, metres above your head. That's the concept behind **Greenhouse by Joost** dining spots, conceived by Dutch artist-entrepreneur Joost Bakker.

Adventurous diners in Melbourne, Perth and Sydney have already had a taste. Joost's first pop-up restaurant sprouted in Melbourne's Federation Square in 2008 and its success inspired a permanent restaurant, Greenhouse St Georges Terrace, in Perth. The latest pop-up, in February, was in Sydney's The Rocks. All are assembled from recycled components. The walls form vertical gardens, where produce is grown; all water is recycled; waste is composted, and straw bales are used for insulation. Bread, pastry, yoghurt and butter are made on site, as is tonic, soda and cola for drinks. Even recycled jars find new life as glasses.

Leesa Hamilton

circulating around the greenhouse. Every so often, each tray stops at computer-controlled feeding stations where water and nutrients are introduced through hydroponics technologies. The plants – which are grown without soil using a water-based bare root system – then drift slowly on like parts on a car production line.

Europe's first "vertical farm" may look surreal, but similar sights could soon be common. "By building upwards in an area half the size of a tennis court, with the temperature controlled, we're producing the same amount of crops as a three-acre [1.2 hectare] field," says Kevin Frediani, Paignton Zoo's curator of plants and gardens. "We only use five per cent of the water, too – all of which is recycled."

By 2050, farmers face the challenge of feeding an extra three billion people worldwide. Their combined thirst will mean 18% less water for agriculture. Since 1970, population growth has almost halved the amount of arable land per person to 0.2ha.

"The soil-based farming model will no longer be sustainable," says Dr Dickson Despommier, who leads research into vertical farms at the Department of Environmental Health Sciences at Columbia University, New York. Both he and Frediani believe that a new type of agriculture is essential for the planet and humanity's wellbeing.

Frediani, 43, first got involved with the project in August 2008. The zoo was hosting its annual Green Solutions

PHOTOS: (JOOST) EARL CARTER PHOTOGRAPHY; VALCENT/PAIGNTON ZOO

Kevin Frediani tends crops in Paignton Zoo's vertical farm, half the size of a tennis court

"If you're one step ahead of the crowd you're considered a genius; two steps ahead, you're a madman"
Kevin Frediani

Festival, celebrating all things environmental. One exhibitor, Valcent Products, had brought a model of a vertical fresh-leaf growing system called VertiCrop. The Canadian firm already had a pilot project up and running in El Paso, Texas, growing algae crops as biofuels. Frediani was convinced it had a place at Paignton.

Not only could vertical farming feed the zoo animals a nutritious diet, he realised, but the implications for growing fresh food for humans in space-crunched urban settings – reducing transport bills and carbon emissions – or in places with very little water were clear.

"If you're one step ahead of the crowd you're considered a genius; two steps ahead, you're a madman," smiles Frediani, previously head of gardens at Hortus Botanicus in Amsterdam, one of the world's oldest botanical gardens. "But I wanted to prove that there was a new way of feeding people."

His enthusiasm won over the zoo's directors and the $54,000, 43-square-metre building was erected in September 2009 in an old elephant paddock. Valcent covered the

High-rise food passes the crucial jumbo taste test

PHOTO: VALCENT/PAIGNTON ZOO

approximately $97,000 cost of the growing equipment.

Despite the automated appearance, the system does require some human effort. Planting and harvesting are done with gardening scissors and the trays are lifted up and down on a forklift.

However, it's been a practical and commercial success. Because the system is indoors, it's protected from weather-related crop failures and the plants don't need herbicides or pesticides. It's feeding all of the zoo's animals (keep in mind that one hippopotamus can munch through 45kg of vegetation every day) at 10% less than it previously cost.

Saving money doesn't mean the quality of the animals' food has suffered, either. VertiCrop can grow as much lettuce as a commercial 183-square-metre greenhouse, but Frediani dismisses lettuce as "green water with some nutrients".

"Rocket has two-and-a-half times the nutritional value [of lettuce] and I can grow it for the same price – which you can't do outside," says Frediani. He believes that all these benefits, and more, could be replicated if VertiCrop was used to feed humans.

"Hospitals, schools, offices and supermarkets could all have vertical farms growing from seed to leaf, producing fresher food where we live and work. As well as being cheaper, it would cut down on food miles, create local jobs and make a quality diet much more accessible."

Dilapidated urban areas could also be rejuvenated, with former warehouses or factories converted into farms using solar-powered LEDs and plasma lighting in place of direct sunlight.

And, surprisingly, this vision is already within reach. Valcent is now in discussions with one of the UK's leading supermarket suppliers of ready-washed salads. The company currently transports all its green leaves from Spain to Britain by truck but is looking at building a 244-square-metre vertical farm in southern England.

"It should be up and running in the first half of this year," says Valcent's head Chris Bradford. Visitors from Australia, Singapore, India and Hong Kong have also beaten a path to Paignton Zoo, and Valcent has possible tie-ups in Canada and the US, too.

Meanwhile, in California, a company called Sky Vegetables plans to grow crops hydroponically (without soil) in greenhouses on top of grocery stores, eliminating up to 80% of the cost of production, packaging and distribution. And Dr Despommier is trying to raise $20 million to build a 33-storey vertical farm in New York that could feed 50,000 people. Fifty more would feed the entire city.

Vertical farming, or other hydroponics systems, may not totally replace traditional agriculture, he says. "But we do have to move away from mono-agriculture towards a more integrated approach where we use our land more efficiently.

"Horticulture hasn't ever been regarded as the sexiest of professions – but that could be set to change." ■

FILE UNDER "OOPS"

An Australian cookbook had to go back to the printer after one of its recipes called for "salt and freshly ground black people". That wasn't the only mistake sent to press:

From an ad for medical services in a US newspaper: "With a regular visit to your medical provider, you can increase your chances of catching major illnesses early."
Frances Schmetzer

From a wedding announcement page: "The six attendants wore blue raw silk dresses with pockets and varying necklines that hit right below the knee."
Judy Caldwell

From a flier for home repairs: "All permanent repairs guaranteed for one year."
Rosemary Fairweather